Protesting Pollution Sources – A Simulation / Group Project

Grades

8-12

Subjects:

Health, Physical Science, Biological Science, English, Math

Duration:

Long term assignment + presentation = open time table

Objectives:

TSWBAT conduct independent research to gather information for a group project.
TSWBAT identify a local/regional pollution problem and the impact to human health.
TSWBAT describe the chemical and biological behavior of the pollution.
TSWBAT describe how to protect humans from exposure and how to treat exposed humans.
TSWBAT propose solutions/alternatives to the pollution problem in question.

Set:

See "Identifying Sources of Pollution" lesson plan for a good opener.

Instructional Input:

Students should be placed into cooperative groups of no more than five students and preferably no less than three.

Students represent a local concerned citizen's group. The citizen's group is concerned with a local/regional pollution problem that is effecting their community.

Students must answer the following:

1. Identify the type of pollution they are concerned with (see the "Identifying Sources of Pollution" lesson plan and modify it for your classroom)
2. Identify the activity (industry, manufacture process, agriculture) that is producing the pollution. Identify all sources in your area that contribute to this problem.
3. Identify who is producing the pollution, where the pollution is produced, how it is produced, and why it is produced.
4. Be able to explain the chemical process, which produces the pollution. Write out and explain the chemical reaction in balanced equations.

5. How is it released to the environment?
6. What form (solid, liquid, gas) is the pollution found in the environment? Provide the chemical formula or symbol.
7. How much is released to the environment from each source over time? (if available)
8. How does it behave in the environment? Identify and explain any secondary reactions this pollution my cause when it enters the environment. INCLUDE
   - Behavior in air, water, soil (if appropriate)
   - Behavior in plants and animals (if appropriate)
   - Behavior in humans (biochemical reactions)
9. What is the extent of the contamination now and in the future? How far has it spread? What is its concentration in the environment? How has it impacted the environment?
10. How are humans exposed to this pollution? How do they come into contact with it? How does it enter their system?
11. How does this pollution impact human health? Who is at risk?
12. How can humans be protected from exposure to this pollution? How can they be treated if they are exposed, or is there no effective treatment at all?
13. What are the approximate costs of treating exposed humans (per case or total)? What are the clean up costs (how much does it cost to remove the pollution from the environment – remediation)? Check hospitals, EPA, and/or insurance companies for information.
14. How can this pollution be reduced or eliminated? Are there any alternatives that would avoid producing this pollution at all? What are the costs? How would this effect business and society?

Students should compile this information into a report and a presentation. Presentations should be made in front of the class. The class will then be responsible for generating questions for the presenters. Presenters must be prepared to defend their positions with facts and references.

Research:

Use the library, Internet, and professionals as resources. Attached to this lesson plan are some links to help the students get started. Local health and environmental officials, plant engineers and risk managers, chemists, and toxicologists are also excellent resources.

Evaluation:

Evaluation should take many forms for this long-term assignment.

Students should have the chance to assess the work of their teammates. Also, rubrics should be developed for the papers and the presentations. Class participation should also be assessed (quality of questions, showing courtesy and respect to presenters).

Closure:

Take a hand poll from students regarding which pollution sources they regard as being the most critical.
Ask students to write a 5 minute essay about which source they think is most important and why. Invite students to share their reactions.

Links:

Brief summary of many different hazardous substances.
http://www.nce.unr.edu/swp/water_factsheets.htm

Excellent links to many hazardous substances identified by the EPA.
http://www.epa.gov/ebtpages/pollutants.html

ATSDR's ToxFAQs – extensive fact sheets on many hazardous substances.
http://www.atsdr.cdc.gov/toxfaq.html

Top 20 Hazardous Substances.
http://www.atsdr.cdc.gov/cxcx3.html

United States National Library of Medicine. Health effects and treatment for exposure to hazardous substances.
http://www.nlm.nih.gov/pubs/factsheets/hsdbfs.html

EPA Web site ("About the EPA")
http://www.epa.gov/epahome/aboutepa.htm

ATSDR Web site (link to "ATSDR FAQs" and About "ATSDR")
http://www.atsdr.cdc.gov/

CDC Web Site
http://www.cdc.gov

Idaho Department of Health and Welfare, Divison of Health, Bureau of Environmental Health and Safety
http://www2.state.id.us/dhw/BEHS/index.htm

DEQ Web site
http://www2.state.id.us/deq/

These are by no means the only sources available!